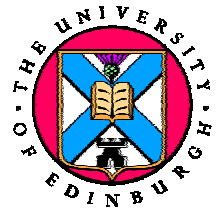
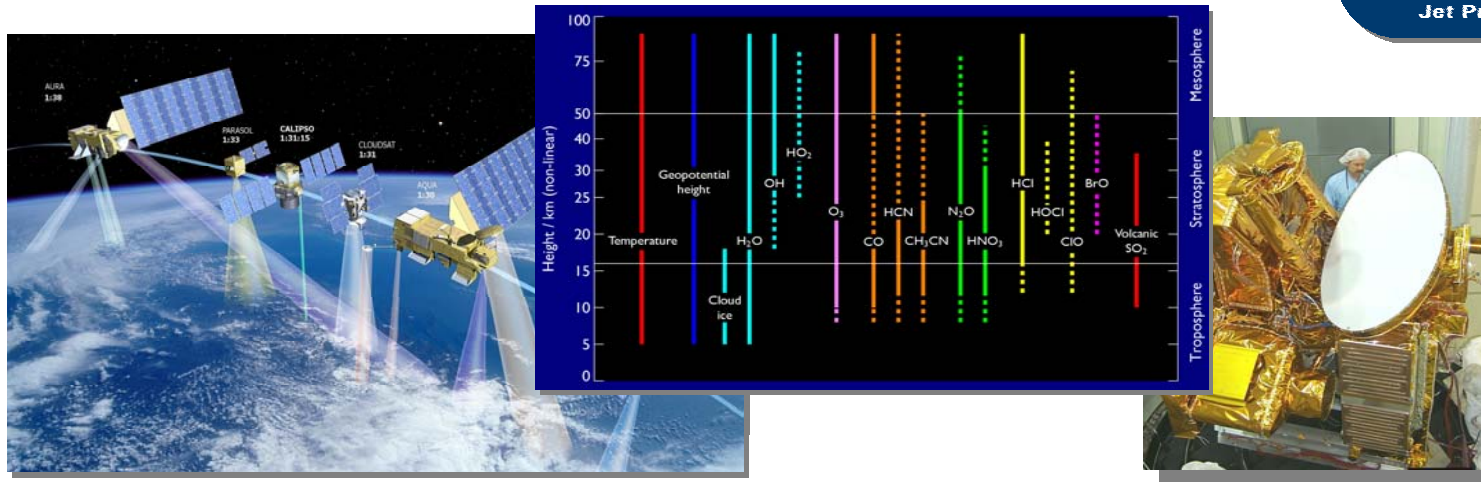
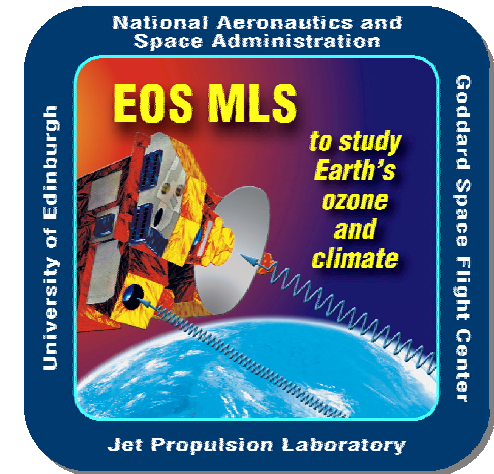
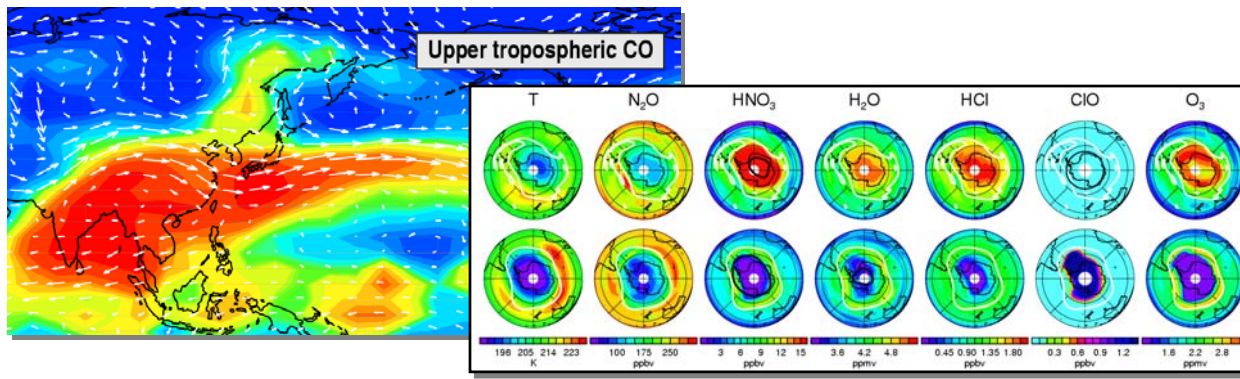


Aura Science Team Meeting

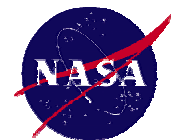
Microwave Limb Sounder Overview



Nathaniel Livesey on behalf of the MLS team



New addition to the MLS team at JPL



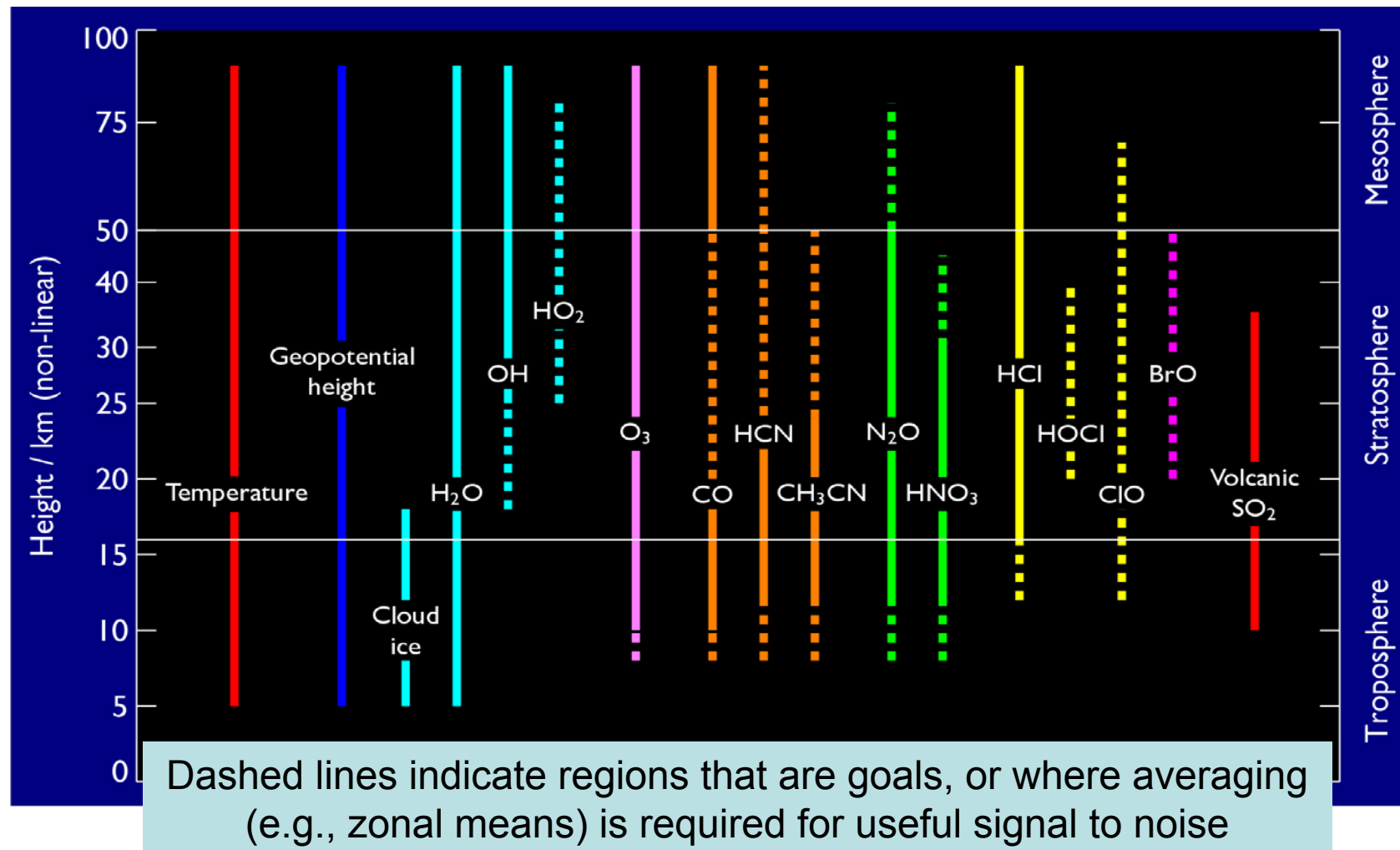
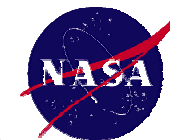
2

- Last year, Joe Waters stepped down as MLS Principal Investigator
- However, we have since added a new key player to the MLS team...



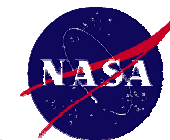
**Soccer superstar
David Beckham
joins MLS team
in Los Angeles!**

MLS data products

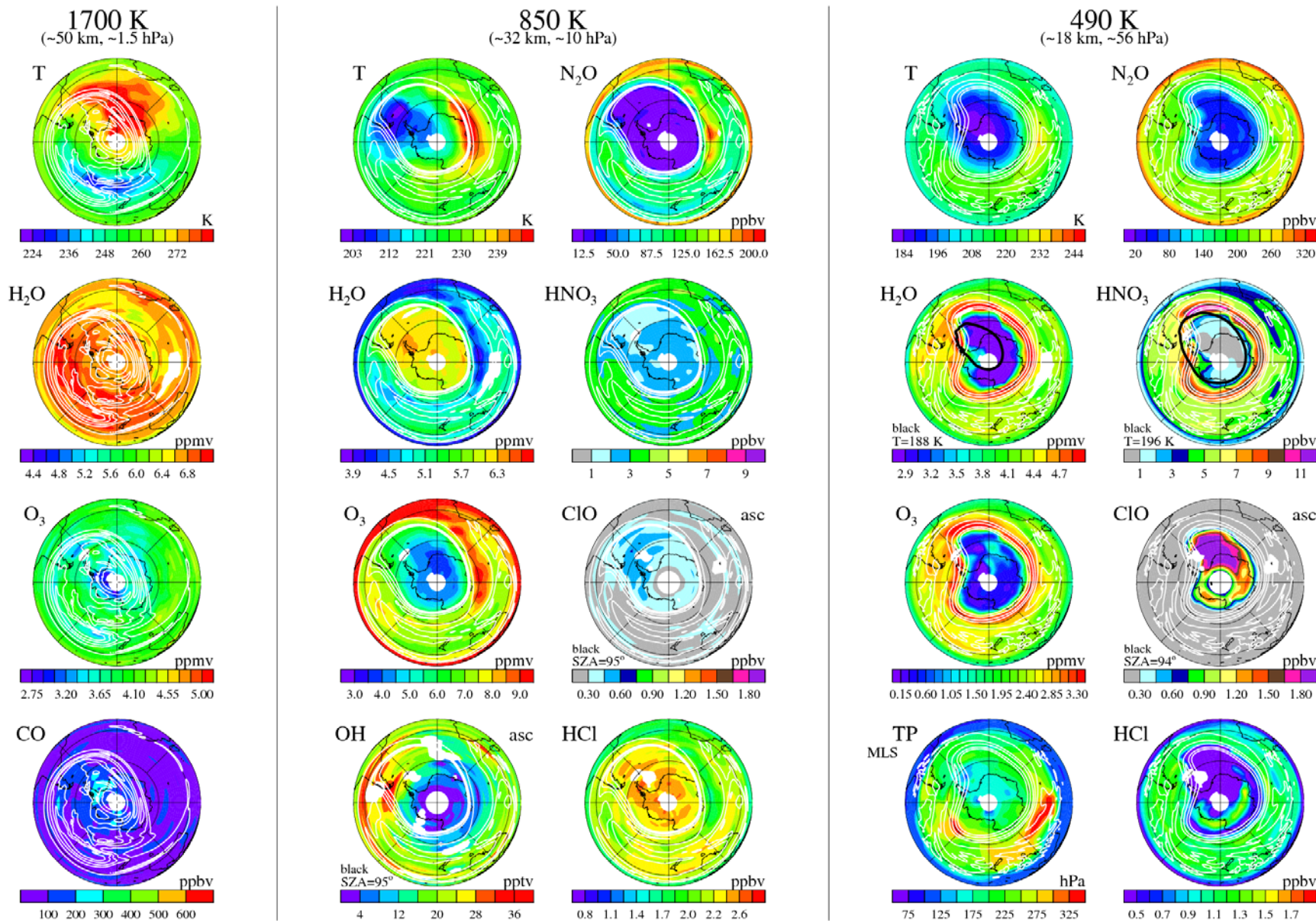


- All MLS data are publicly available from GSFC DISC (formerly DAAC)
- The latest version of MLS data is v2.2

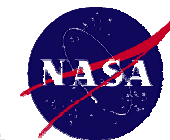
MLS strat. observations, 16 Sep. 2007



4



MLS version 2.2 data processing progress



5

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Aug-04								221						226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241			
Sep-04	245	246	247	248	249	250	251			254			257			260	261	262	263	264	265	266	267	268	269	270	271	272				
Oct-04	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289					293	294	295	296	297	298	299	300	301	302			
Nov-04	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333				
Dec-04	335	336	337	338	339	340		342			345	346	347	348	349	350	351	352	353			356	357	358	359	360	361	362				
Jan-05	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28				
Feb-05	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59				
Mar-05	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87				
Apr-05	91	92	93	94			97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118				
May-05	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137			139	140	141	142	143	144	145	146	147	148			
Jun-05	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179				
Jul-05	182	183	184	185	186	187	188	189	190	191	192	193		195	196	197	198	199	200	201	202	203	204	205	206	207	208	209				
Aug-05	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240				
Sep-05	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271				
Oct-05	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292		294	295	296	297	298	299	300	301				
Nov-05	305		307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332				
Dec-05	335	336	337	338	339	340	341	342	343		345	346	347	348	349	350	351		353	354	355	356	357	358	359	360	361	362				
Jan-06	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28				
Feb-06	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52		54	55	56	57	58	59				
Mar-06	60	61	62	63	64	65	66		68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87				
Apr-06					95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118				
May-06	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148				
Jun-06	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179				
Jul-06	182	183	184	185	186	187	188	189	190		192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209				
Aug-06	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240				
Sep-06	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271				
Oct-06	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301				
Nov-06	305	306		308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332				
Dec-06	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362				
Jan-07	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28				
Feb-07	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59				
Mar-07		61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87				
Apr-07	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115		117	118	119	120		
May-07	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	
Jun-07	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181		
Jul-07	182	183	184	185	186	187	188	189	190	191	192	193		195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	
Aug-07	213	214	215	216	217	218			221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	
Sep-07	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273		
Oct-07	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	

Green
show
proce
v2.2 to

Plann
soon to
upgra
new 'v'
softwa
faster

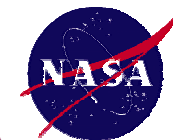
Repro
shoul
aroun
Spring

Green boxes show days processed to v2.2 to date

Planning soon to upgrade to new 'v2.22' software (~2x faster)

Reprocessing should finish around Spring 2008

MLS v2.2 val. papers & quality document



Manuscripts led by MLS team:

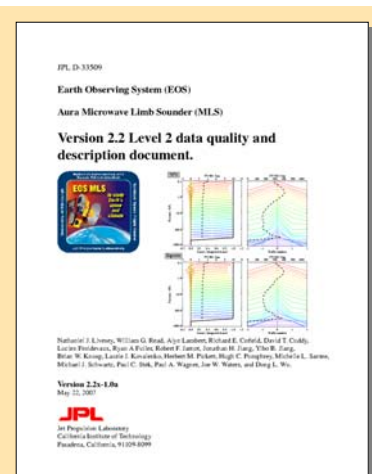
Froidevaux et al.: HCl
Froidevaux et al.: Strat. / mes. O₃
Jiang, Y. et al.: O₃ sonde and lidar
Kovalenko et al.: BrO
Lambert et al.: Strat. / mes. H₂O & N₂O
Livesey et al.: UT/LS CO and O₃
Manney et al.: Non-coincident validation
Pickett et al.: OH and HO₂
Pumphrey et al.: Strat. / mes. CO
Read et al.: UT/LS H₂O
Santee et al.: ClO
Santee et al.: HNO₃
Schwartz et al.: Temperature & GPH
Wu et al.: Cloud ice

Manuscripts led by others:

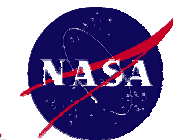
Barnes et al.: Raman Lidar and MLS H₂O
Boyd et al.: O₃ and ground-based μ wave
Coffey et al.: Airborne FTS
Connor et al.: ClO and grnd-based μ wave
Considine et al.: Non-coincident validation
Feng et al.: O₃ ECMWF assimilation
Lary et al.: Satellite HCl comparison
Nedoluha et al.: H₂O, ground-based μ wave
Petropavlovskikh et al.: O₃ and CAFS
Schoeberl et al.: OMI – trajectory MLS O₃
Stajner et al.: O₃ assimilation
Vömel et al.: Sonde H₂O
Yang et al.: OMI–MLS O₃

The v2.2 data quality document is a comprehensive reference for product-by-product screening rules, estimated accuracies and validation summaries

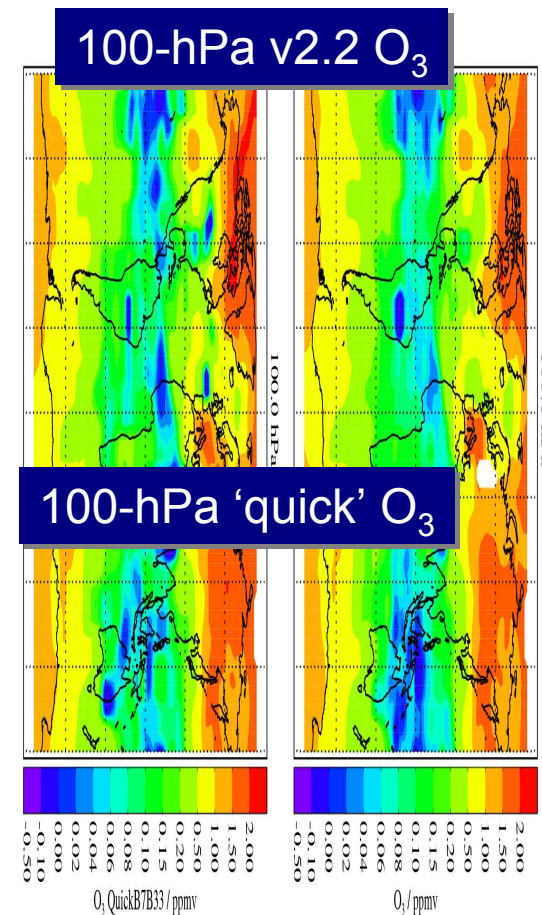
<http://mls.jpl.nasa.gov/>



MLS plans for 'near-real-time' data

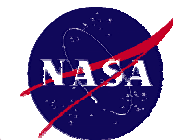


- MLS O₃ has been assimilated into several state-of-the-art models
 - GMAO – Ivanka Stajner
 - NOAA – Craig Long
 - ECMWF – Liang Feng
 - UK Met. Office – David Jackson
 - NRL – Karl Hoppel (also Temperature)
- Many of these organizations would like to include 'near-real-time' MLS data in operational systems
- Initial development of this is underway, with a goal of having a prototype in place for ARCTAS



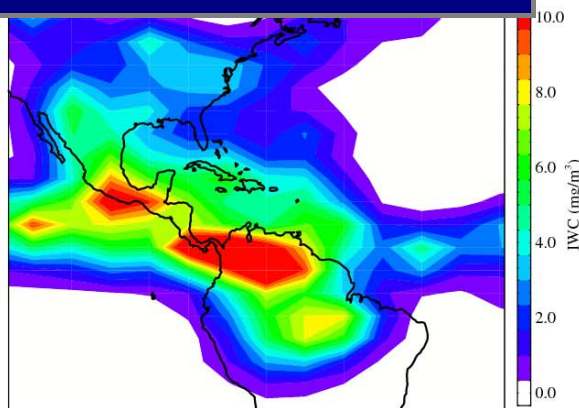
See Alyn Lambert's poster for more information

MLS observations during TC⁴ campaign

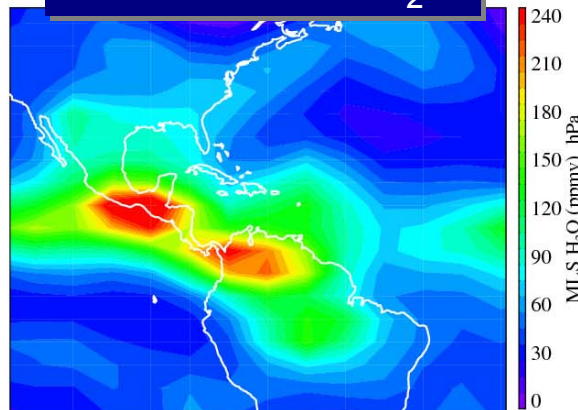


8

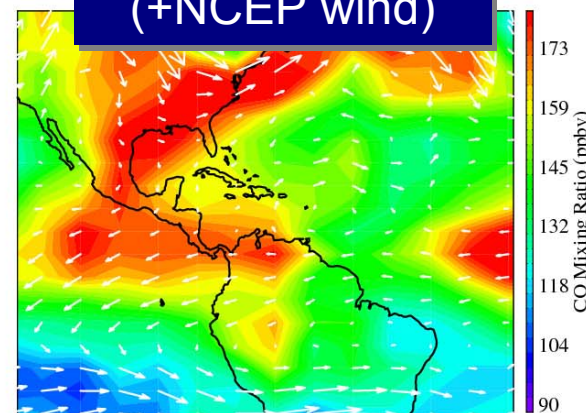
MLS 215-hPa Cloud ice



MLS 215-hPa H₂O

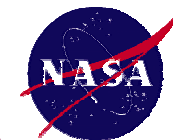


MLS 215-hPa CO
(+NCEP wind)

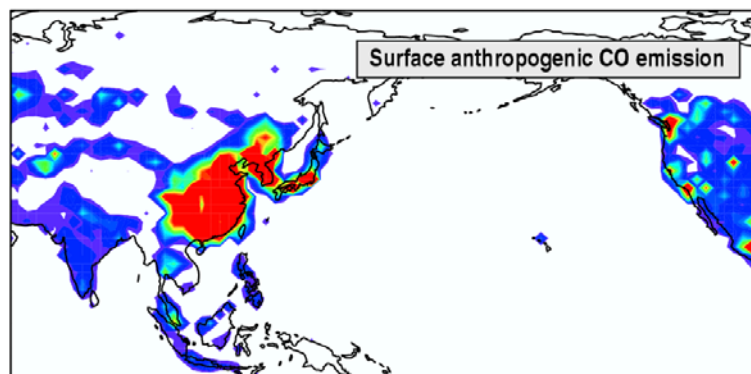
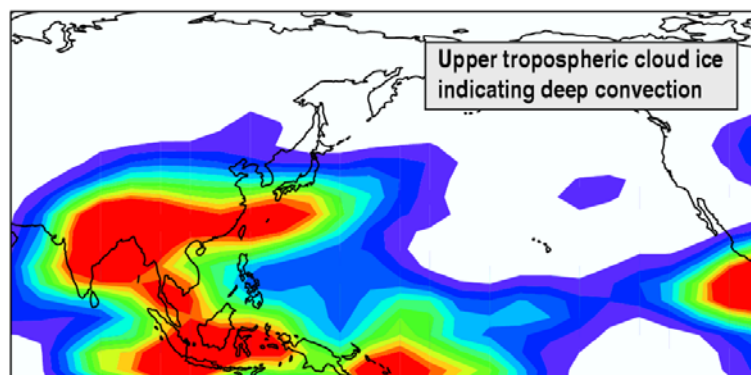
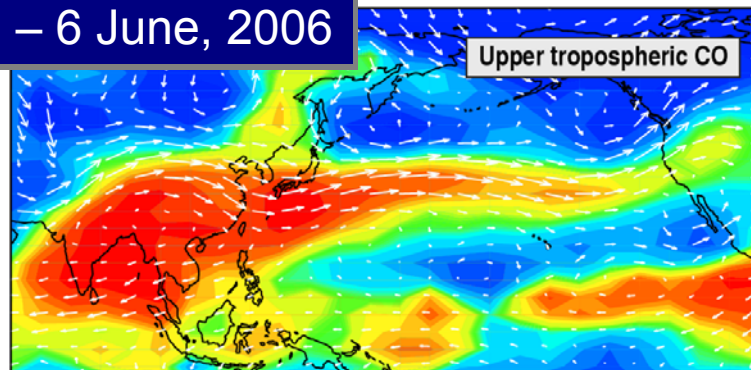


- Maps show MLS 215-hPa observations during the 15 – 21 July phase of TC⁴
 - Influences of convection and long-range transport on CO clearly seen
- During the TC⁴ campaign, part of the MLS 640-GHz subsystem shut down
 - Probably due to a radiation-induced Single Event Upset
 - The affected period was 14 July to 9 August
- During this time MLS did not measure HCl, BrO, HO₂ or HOCl
 - 190-GHz data are available for ClO and N₂O, in lieu of 640-GHz products
- All other products were unaffected

Impact of convection on upper trop. CO

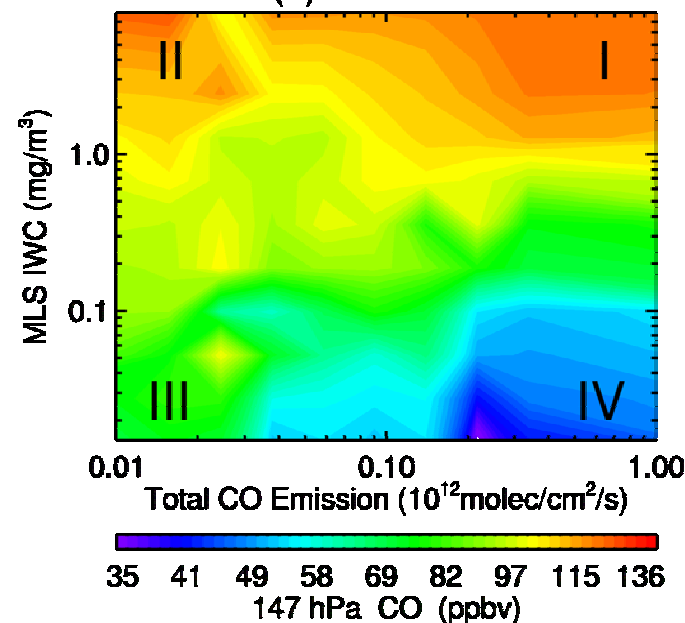


1 – 6 June, 2006



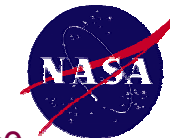
- CO in the upper troposphere is influenced by a combination of surface emissions, convective lofting and horizontal transport
- Plot shows MLS 147 hPa CO for 09/04–09/06, binned by emissions and MLS cloud ice (indicating convection)

(a) Aura MLS



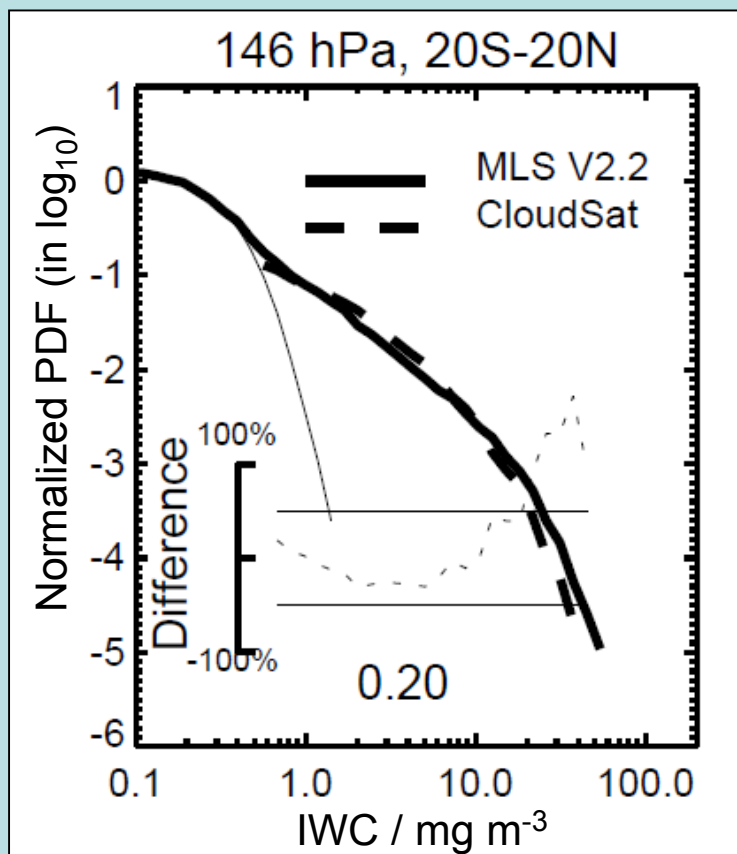
From Jiang (Jonathan) et al., GRL, in press

MLS cloud ice validation and science

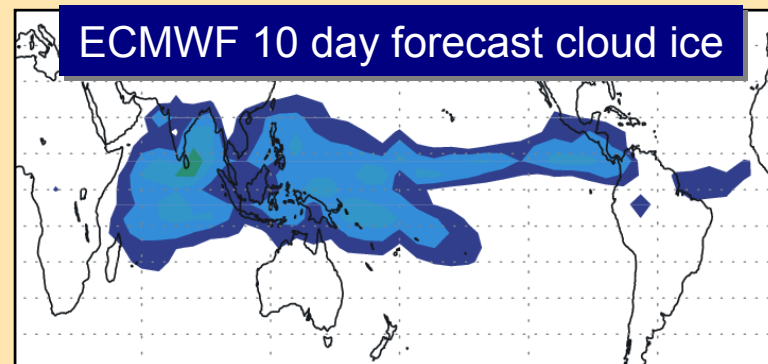
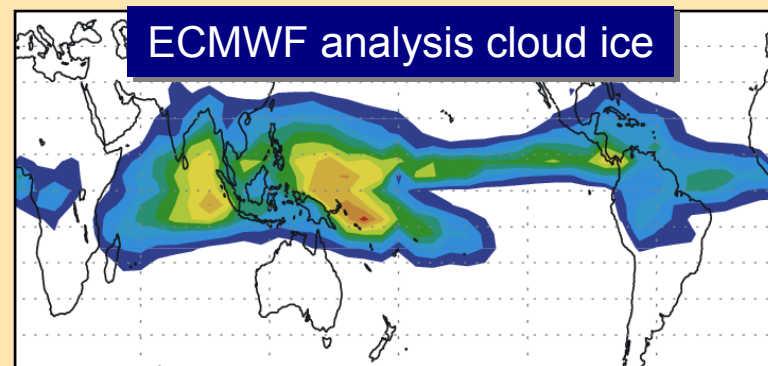
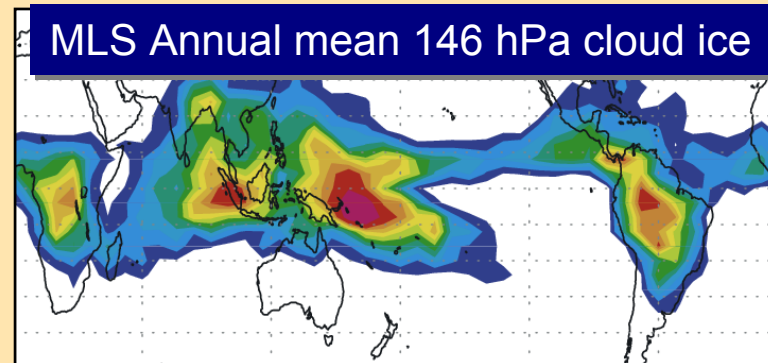


10

- Statistical approaches have been a major focus of MLS cloud ice validation
- Plot compares PDFs of July 2006 MLS and CloudSat cloud ice water content

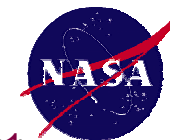


From Wu et al., JGR, submitted



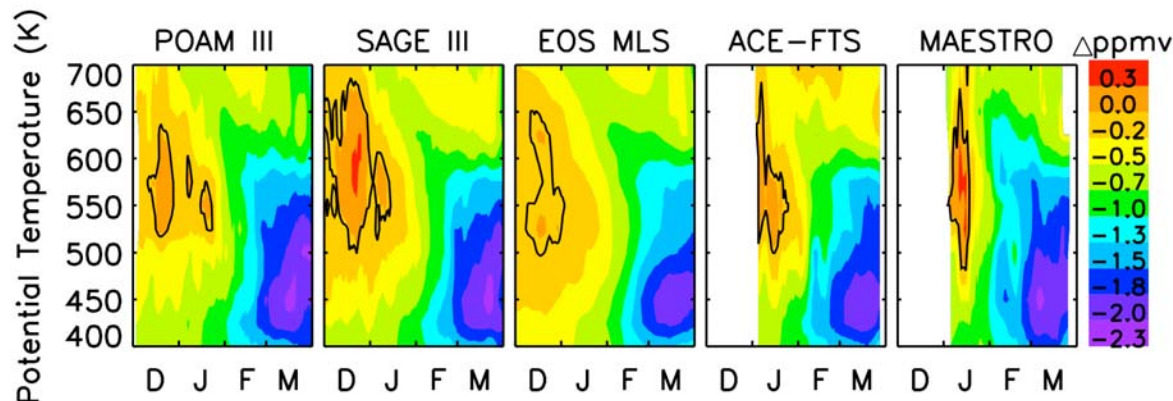
From J.-L. (Frank) Li et al., GRL, 2007

Stratospheric and mesospheric studies

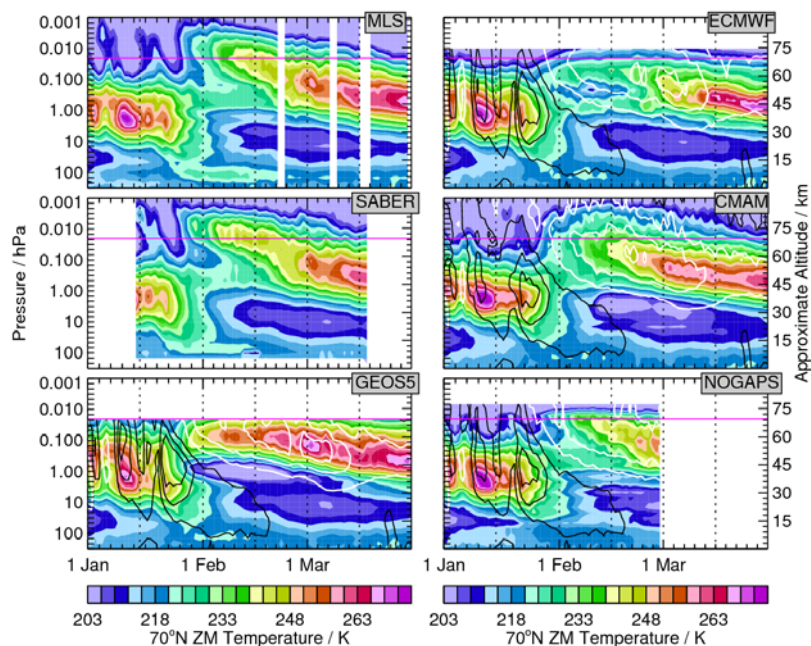


11

- MLS data used to quantify Arctic chemical O_3 loss, discounting changes in O_3 due to transport
- Daily variations in MLS O_3 compared to 'passive O_3 ' tracer from SLIMCAT



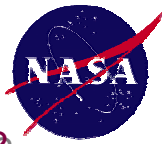
From Singleton et al., JGR, 2007



- MLS daily global US/LM temperature data give new insight into stratopause evolution during major warmings
- Analyses fail to capture stratopause reformation at ~ 0.01 hPa
- NOGAPS model, which assimilates MLS temperatures, shows better agreement than other analyses

From Manney et al., JGR, submitted

Summary and future plans



12

- The MLS instrument continues to operate well
- Version 2.2 reprocessing is expected to be complete in Spring 2008
 - All MLS data are publicly available from the GSFC DISC
 - The many validation papers and the v2.2 quality document provide important information for MLS data users
- A 'near-real-time' data processing capability is planned for selected products
- Goals for future product improvements include:
 - Eliminating or reducing the factor of ~2 high bias in 215 hPa CO
 - Extending O₃, CO, H₂O and HNO₃ retrievals lower in the troposphere
 - Better handling of cloud signatures and joint cloud / chemistry retrievals
 - Retrievals of some new species (e.g., stratospheric CH₃Cl)
- MLS data are being used in a wide variety of scientific studies
 - ~75 peer reviewed papers published or in press to date